



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
Four Penn Center – 1600 John F Kennedy Blvd
Philadelphia, Pennsylvania 19103-2852

Report Title: Clean Air Act Inspection of Wilmington Renewable Energy
Biosolids Facility
Inspection Date(s): 09/19/2022
Regulatory Program(s): Title V and NSPS
Company Name: Jacobs Solutions Inc. or Jacobs Engineering Group Inc.
Facility Name: Wilmington Renewable Energy Biosolids Facility
Facility Location: 12th and Hay Road
Wilmington, DE 19809
Latitude: 39.72954 **Longitude:** -75.517509
County/Parish: New Castle County
AFS Number: DE0000001000300899
Permit Number: AQM-003/00899
NAICS Code: 221320 **SIC:** 49539907
Unique Project #: 3E22CA003A

Facility Representatives:		Point of Contact
Liie Hill, Engineering Manager		<input checked="" type="checkbox"/>
Phone: 575-571-1610	Contact: liie.hill@jacobs.com	
Ron Gillen, Project Manager		<input type="checkbox"/>
Phone: 302-985-6037	Contact: ronald.gillenardo@jacobs.com	

EPA Inspectors:
Erin Willard, Environmental Scientist, 3ED21
Phone: 215-814-2152 Contact: willard.erinm@epa.gov
Carly Joseph, Environmental Scientist, 3ED21
Phone: 215-814-2127 Contact: joseph.carly@epa.gov

State/Local Inspectors:
Kathy Pirestani, DNREC, Permit Engineer
Phone: 302-3234542 Contact: katayoun.pirestani@delaware.gov

EPA Lead Inspector

Signature

Carly Joseph

Date

Four Penn Center – 1600 John F Kennedy Blvd
(3ED21)
Philadelphia, PA 19103-2852

Supervisor

Signature

Erin Malone

Date

Table of Contents

<u>Section</u>	<u>Page</u>
I Introduction.....	3
A Summary of the Facility.....	3
B Inspection Opening Conference.....	3
II Site Activity/Process Information.....	3
III Observations.....	6
IIII Records Review.....	7
V Closing Conference.....	8
VI List of Attachments.....	9

I. Introduction

The United States Environmental Protection Agency (EPA) conducted a Clean Air Act (CAA) inspection at Wilmington Renewable Energy Biosolids Facility (REBF or Facility) to verify compliance with applicable State and Federal regulations. The Delaware Natural Resources and Environmental Control (DNREC) was notified of the inspection on September 6, 2022, via email. On September 15, 2022, EPA notified the Facility of the planned inspection via phone and email. EPA emailed a list of records for review to Liie Hill, prior to the inspection (see Attachment 1). These records are listed in the Records Review section of the report.

A. Summary of the Facility

The Facility is located at 12th and Hay Road, Wilmington, DE 19809. REBF is permitted to combust natural gas, landfill gas, or a blend of sewage sludge digester gas and landfill gas to generate electricity to operate the City of Wilmington Water Pollution Control Facility (WPCF) and REBF. The Facility also operates a sludge drier to dry digested sewage sludge to produce class A sludge. Class A sludge is a beneficial reuse category and can be used for soil amendment purposes on farms and golf courses.

DNREC issued a construction permit in 2013 to Honeywell International Inc (the original owner and operator of the Facility) and a Title V Permit (AQM-003/00899) on September 24, 2018, that expires September 24, 2023. The Facility is classified as major for its potential to emit volatile organic compounds (VOCs), hazardous air pollutants (HAPs), and nitrogen oxides (NO_x). Initial emission calculation for the facility included emissions from the Wilmington WPCF. The Facility is subject to 40 C.F.R. Part 63, Subpart DDDDD - National Emission Standards for Hazardous Air Pollutants for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters.

B. Inspection Opening Conference

At 9:00 AM on September 19, 2022, EPA inspectors arrived at the Facility for a CAA Inspection and conducted a brief opening conference. Wilmington Renewable Energy Biosolids Facility was represented by Liie Hill, and Kathy Pirestani of DNREC was present. EPA inspectors, Erin Willard and Carly Joseph, presented their credentials and explained that the purpose of the visit was to conduct a CAA inspection to determine compliance with the CAA permit and any applicable state and federal regulations. Additionally, EPA informed the facility representatives of their right to claim any confidential business information (CBI). EPA explained that photographs would be taken during the inspection. At that time, Liie Hill did not claim any photos or documentation as CBI. Liie Hill received a copy of the CBI form to review and sign.

II. Site Activity/Process Description

REBF is owned by the City of Wilmington. Honeywell International Inc. (Honeywell) operated REBF from 2013 to 2020 and Jacobs Engineering (Jacobs) acquired the contract to operate REBF in 2020. REBF operates seven days a week, 24 hours a day, and currently has two full time employees. REBF has a day operator and boiler mechanic Monday through Friday during

the day. At night and on the weekends, REBF is operated by the dewatering solids operator stationed at Wilmington WPCF, which is also operated by Jacobs.

REBF operates two 2-megawatt (MW) Cummins Engines, equipped with Selective Catalytic Reduction (SCR) and carbon monoxide (CO) catalyst, to generate electricity for Wilmington WPCF and REBF. REBF operates a hot water boiler, with a maximum rated heat capacity of 8.2 MMBTU/ hr, that generates hot water for use in circulating through the sludge digester piping. The facility also operates a biogas (thermal fluid) boiler, with a maximum rated heat capacity of 14.5 MMBtu/hr, that heat the thermal fluid that circulates through the sludge dryer. The sludge dryer has an associated baghouse, to produce Class A sludge, and a biosolids storage silo, equipped with an odor biofilter. All combustion sources are fired on natural gas, landfill gas, or a blend of landfill gas and digester gas.

Performance tests are conducted on the 2-MW Cummins engines every 3 years or 8,760 hours, whichever comes first. Tests are conducted at 80%- 90% of the maximum load design capacity or 1,800-KW. The engines are tested while combusting a fuel type that is representative of what is normally combusted in the units, which is landfill gas only or a blend of landfill and digester gas. The last performance tests in August 2022 were conducted using landfill gas only since the facility has historically been unable to operate a blower necessary for blending landfill and digester gasses. Both engines have SCR to reduce NO_x emissions and a CO catalyst. No follow-up urea slip testing has been conducted since the initial test to demonstrate urea slip rates at different injection rates and engine loads. Instead, the amount of urea injected is based upon the load and is calculated using a chart. The catalyst on both Cummins engines was replaced last winter (2021) and at some point prior to 2021 during Honeywell's operation tenure.

REBF purchases landfill gas generated by the Cherry Island Landfill, which is operated by the Delaware Solid Waste Authority (DSWA). Cherry Island Landfill also supplies a substantial amount of gas to a local chemical manufacturing company, Croda. Cherry Island Renewable Energy (CIRE) is the entity in charge of treating and metering the landfill gas so that it can be combusted by REBF. CIRE is a subsidiary of Cummins, the manufacturer that supplied the engines to REBF. Before the digester gas and landfill gas is combusted in REBF's engines and boilers, CIRE treats the gas for, or removes, hydrogen sulfide (H₂S) and siloxane just prior to sending the fuel to the engines. The landfill gas also undergoes preliminary H₂S removal at Cherry Island landfill's treatment skid, which is located adjacent to the landfill (across the street from the REBF site). Heating value calculations for the landfill gas is based on the total percent methane content in the gas, which is monitored on a continuous basis.

The CIRE treatment system is designed to allow for blending of sludge digester gas with landfill gas prior to the engine units; however, the blower that facilitates that blending has not been in operation since the inception of the site. Liie Hill indicated the blower was not designed correctly, and so digester gas has never been able to be blended for combustion in the Cummins engines. If the blower is operational, blending of the digester and landfill gas happens before both gases are treated for siloxane in the second treatment skid. REBF plans to replace the blower but are currently facing supply chain issues. Because the blower is not operational, all digester gas is currently being combusted at flares located at the digesters; these units are permitted as part of the wastewater treatment permit. REBF also owns a hot water boiler that is

used to heat water for the digester. When REBF is not combusting digester gas, the hot water boiler does not operate because the heat from the boiler is wasted. REBF plans to begin operating the hot water boiler once they replace the blower and begin burning digester gas.

Next, the landfill gas or blended landfill/digester gas undergoes a second treatment at REBF'S treatment skid for siloxanes, allowing it to then be used as a fuel source for the Cummins engines. REBF is not responsible for the landfill gas or digester gas until after it is treated by CIRE for either H₂S alone or H₂S and siloxane. Landfill gas is treated and tested by CIRE for quality. If the quality of the landfill gas is not good enough to be burned in the 2-MW Cummins engines, REBF can choose not to purchase the landfill gas and can operate the engines on natural gas purchased from Delmarva Power instead. REBF cannot operate the 2-MW Cummins engines using a blend of digester gas and natural gas. If REBF does not purchase landfill gas from Cherry Island Landfill, the gas is flared at the landfill site.

CIRE operates isolation valves for the digester and landfill gas that can shut off both fuel lines to the engines and boilers. REBF meters digester gas and landfill gas onsite. The combined maximum electricity demand for REBF and Wilmington WPCF is 3,000-3,400 KW site wide. REBF is unable to physically generate excess electricity to sell back to the grid. Due to this inability to shed electricity back to the grid, REBF's 2 MW engines operate at approximately 65% of the maximum design load to generate 1,600 KW each. To ensure that electricity is not pushed back to the grid, Delmarva Power requires REBF to purchase the remaining 200 KW to meet their demand.

REBF receives Class B sludge from Wilmington POTW's digesters. Class B sludge is produced by the process of anaerobic digestion in one of six 1.47-million-gallon floating roof sewage sludge digestors, each with a retention time of 20-25 days. REBF operates a biogas boiler to heat the thermal fluid, called paratherm, for the sludge dryer. Paratherm is then circulated inside the sludge drier in piping and inside a screw mixer to heat the sludge and drive off excess moisture. If the biogas boiler is out of service, then the sludge dryer does not operate. Class B sludge enters the sludge dryer at 80% moisture and leaves with approximately 10% moisture as Class A sludge. If the sludge dryer is operating, one or two 20-ton trucks of sludge is disposed of instead of eight or nine 20-ton trucks. The sludge dryer assists in disposal cost by removing a large amount of water from the sludge before disposal transportation.

The evaporated water from the dried sludge is cooled down and condensed. The condensed water is routed to the plant drain and back to the head works to be retreated through the wastewater treatment plant. A blower vents gases from the drier vessel, that is released during the drying of the Class B sludge, into a biofilter that is released out of a stack at the top of the building. REBF operates a baghouse on top of the enclosed screw conveyor belt during the truck loading process to capture airborne debris from the dried Class A sludge. The baghouse has manual pressure drop (ΔP) gauge that Jacobs employees monitor and record manually during the loading process. REBF also has an enclosed silo with a nitrogen blanket that is associated with the sludge loadout process.

The opening conference concluded at 10:45 AM.

III. Observations

EPA inspectors were led on a walkthrough of the Facility at 11:25 AM by Leii Hill of REBF. Kathy Pirestani from DNREC was also present for the walkthrough. EPA inspectors noted photos would be taken by Erin Willard during the Facility walkthrough (Attachment 2), and that the inspection team would ask prior to taking a photo.

The inspection team walked to the back of the Facility (northern side). EPA walked past the secondary settling tanks and aeration basins, operated by the Wilmington WPCF. Next, the inspection team observed six 1.47-Mg digester tanks for Wilmington WPCF of which only five are operable. Inspectors observed the Sludge Dewatering Building, that conveys dewatered sludge via belts to the sludge dryer; this building is operated by wastewater treatment staff. Inspectors observed CIRE's blending skid. The blending skid has valves that control the gas flowing to REBF combustion units and acts as the ownership separation from CIRE to REBF after the blending of landfill and digester gas. Digester gas is valved to CIRE for hydrogen sulfide treatment then goes to the blower to be blended with landfill gas and treated for siloxane to go to REBF's engines. No siloxane treatment is done for the blended gas or landfill gas that goes to REBF's boilers. As noted above, the blower for gas blending was not operational on the day of the inspection, and rarely operates. Next, inspectors observed the blended gas quality meter that read: 52.5% Methane, 36.8% carbon dioxide, and 1.1% oxygen.

The inspection team walked to REBF's main building and observed the hot water boiler, which was not operating during the time of the inspection. Next, the inspection team observed the sludge dryer process. Liie Hill indicated that the digesters continuously feed the sludge hopper with Class B sludge. The sludge from the hopper falls onto the conveyor belt which continuously feeds the sludge dryer. Prior to entering the sludge dryer, the sludge is pressed, which removes some of the water prior to going into the dryer. The sludge dryer uses indirect heat to remove moisture from the Class B sludge. The water from the sludge goes to the sludge dryer condenser. Then, the blower turns on and forces dryer headspace gas through a biofilter that exits at the top of the building through a stack. Liie Hill indicated that the biofilter's purpose is mostly to control odors. At the time of the inspection the pressure drop (ΔP) through the biofilter was 0.75-inch water column (wc). The biofilter has two scheduled outages per year.

The inspection team broke for lunch at 12:30 PM and continued the walkthrough at 1:40 PM. Next, the inspection team observed the Class A sludge loading area which is equipped with a baghouse. Liie Hill stated that REBF records the pressure drop (ΔP) manually for the baghouse which turns on when the truck is loaded with Class A sludge. The loading area and baghouse were not operating during the time of the inspection. Next, the inspection team walked to the engine room which contained Unit #1 Cummins model number C2000N6C, serial number: K15K88954 and Unit #2 Cummins model number C2000N6C, serial number: E13K503156. The inspection team observed the urea tank room. The urea injection rate was observed from one tank on two separate screens, for each engine.

Lastly, the inspection team observed REBF's rooftop. The inspection team observed the two exhausts for the Cummins engines that exit through the rooftop. On the right side of the roof is a set of piping which is the treatment train for the urea injections for the Cummins engines. Liie Hill explained the exhaust passes through the oxi-catalyst first, which was the first large box.

Next, is the urea injection point, then a set of duct work to induce turbulence where the urea mixes with the exhaust to complete the emissions control reaction. Then the exhaust exits into the atmosphere. The inspection team observed additional piping constructed around the exhaust ducts. Liie Hill indicated the piping is part of the hot oil system from the sludge dryer. The paratherm oil is pumped through the piping adjacent to the exhaust for the engines to preheat the oil before it goes back into the biogas boiler.

The walkthrough concluded at 2:33 PM.

IV. Records Review

The records review commenced immediately after the plant walkthrough at 2:38 PM. EPA inspectors reviewed documents requested in the September 15, 2022, email to Liie Hill (see Attachment 1). Ron Gillen of REBF and Kathy Pirestani of DNREC were present for the records review. Records were provided on October 5th, 2022, by Liie Hill. Below are the records requested and what was provided:

1. Hours of operation for each engine and boiler unit, amount and types of fuel combusted for previous 5 years, including the assumed or measured heating values. Include the % makeup of the blended fuels.
2. Title V Permit Certifications for the previous 5 years
3. Landfill Gas and Digester Gas monitoring data for CH₄, CO₂, O₂ and H₂S
4. All performance test reports for last 5 years for each combustion unit. For the engines, include the test protocols that dictate what engine loads urea injection will be measured.
5. Daily SCR pressure differential monitoring
6. Monitoring data related to urea injection, including:
 - Daily values for concentration,
 - injection rate,
 - injection air pressure, and
 - total volume used on a monthly basis.
7. Records of engine maintenance, including oil changes, and information regarding the EPA Certification information for each unit
8. Records of catalyst changeouts
9. Monthly VE monitoring for each combustion unit
10. Emissions calculations for each unit, including a description of how the emission factor was determined (test, manufacturer, etc), on a monthly and rolling 12-month basis for the following pollutants: NO_x, SO₂, CO, PM, PM₁₀, CO₂, VOC, and HAPs (where applicable)
11. Monthly visible emissions monitoring for each combustion unit
12. Boiler tune-up records, including CO measurements before and after tune-up
13. Initial Notification of Compliance Status for Subpart DDDDD – *May be from Honeywell, Liie Hill will need to search older files*
14. Mercury sampling of the gas being combusted in the boiler – *Initial test along with ammonia slip calculations during that test will be provided*
15. Baghouse and biofilter differential pressure records

16. Hours of operation for the sludge silo on a monthly basis

V. Closing Conference

After the records review, EPA inspectors, Liie Hill, Ron Gillen, and Kathy Pirestani had a brief closing conference to ask additional questions and discuss observations. The EPA inspectors noted that the investigation is on-going, and any areas of concern identified in the final reports do not necessarily reflect a violation or deviation, rather, they are areas that will require further investigation. EPA also noted that they would issue an inspection report within in 60 days, with a copy to DNREC. Simultaneously, EPA will perform a detailed review of records and may have additional questions.

The inspection concluded at 3:33 PM.

No areas of concern were noted at the closing conference. However, EPA noted that a more detailed review of the records obtained for the boilers, engines, and sludge dryers would be performed and that additional questions or records may be requested.

VI. List of Attachments

Attachment 1: Email correspondence to Liie Hill of records requested to review during inspection

Attachment 2: Photo Log